

# PATENT SPECIFICATION

Inventor: ROBERT WILLIAM EADIE.

675,754



Date of filing Complete Specification: Aug. 26, 1948.

Application Date: April 6, 1948. No. 9594/49.

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Index at acceptance:—Class 102(i), A1a(1a: 6), A3f4b1.

## PROVISIONAL SPECIFICATION

### Improvements in or relating to Reciprocating Pumps

We, JOHN GANE SHIRLEY BARROW and MICHAEL WENTWORTH LEWART-WENTWORTH both British Subjects of 41 pinion arranged at the other side of the 40 fixed pinion and annulus, whereby the

#### ERRATUM

SPECIFICATION NO. 675754

In the heading on Page 1, for "No. 9594/49" read "No. 9594/48".

THE PATENT OFFICE,

24th November, 1952

DB 39980/2(5)/5337 100 11/52 R

20 surface in the axial direction of said swash plate which is provided with a number of circumferential teeth in engagement with a planetary pinion which also meshes with a fixed pinion coaxial with said swash plate and having a different number of teeth, the planetary pinion being planetated by means of a driving annulus.

25 In a simple construction, the swash plate comprises a pinion of somewhat smaller diameter arranged coaxially with a fixed pinion, both said pinions being in mesh with the planetary pinion which planetates between the fixed pinion and internal teeth on the annulus, the said 30 annulus being driven by means of a worm engaging on its periphery formed as a worm wheel.

The planetary pinion may be elongated so as to engage upon a second swash plate

action of the planetary pinion causes a differential relative rotation between the swash plate and fixed pinions.

The second form of construction is conveniently made use of when it is desired to eliminate worm and worm wheel gearing and to use straight cut gears only.

The constructions of the pump described above permit a regular and very small amount of liquid to be pumped at substantially high pressures, and the invention is of particular use in, for example, complex machinery wherein a plurality of bearings require minute quantities of oil at regular but infrequent intervals.

Dated this 6th day of April, 1948.

CHATWIN & COMPANY,

253, Gray's Inn Road,

London, W.C.1,

Patent Agents for the Applicants.

[Price 2/8]

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## PROVISIONAL SPECIFICATION

### Improvements in or relating to Reciprocating Pumps

We, JOHN GANE SHIRLEY BARROW and MICHAEL WENTWORTH EWART-WENTWORTH, both British Subjects, of 44, Montrose Place, Chapel Street, London, and 2, New Square, Lincoln's Inn, London, W.C.2, respectively, do hereby declare the nature of this invention, to be as follows:—

This invention relates to pumps of the kind in which a plurality of pistons are actuated by a cam drive, its object being to provide an improved construction having a very high reduction gear.

According to the present invention, a pump comprises a plurality of pistons arranged in a cylinder member or members and actuated by the rotation relative thereto of a swash plate or cam surface in the axial direction of said swash plate which is provided with a number of circumferential teeth in engagement with a planetary pinion which also meshes with a fixed pinion coaxial with said swash plate and having a different number of teeth, the planetary pinion being planetated by means of a driving annulus.

In a simple construction, the swash plate comprises a pinion of somewhat smaller diameter arranged coaxially with a fixed pinion, both said pinions being in mesh with the planetary pinion which planetates between the fixed pinion and internal teeth on the annulus, the said annulus being driven by means of a worm engaging on its periphery formed as a worm wheel.

The planetary pinion may be elongated so as to engage upon a second swash plate

pinion arranged at the other side of the fixed pinion and annulus, whereby the pump can have a double set of pistons.

In a second form of construction, the swash plate may itself form a pinion, and have teeth on its periphery to engage with the planetary pinion which is also in mesh with a fixed pinion arranged adjacent to the swash plate. The planetary pinion is planetated by the rotation of the driving annulus by which it is carried, and which is in turn driven by means of a spur gear coacting with teeth thereon.

The swash plate pinion and the fixed pinion have the same pitch circle to engage with the planetary pinion, but have a number of teeth differing by a small number, whereby the planetary action of the planetary pinion causes a differential relative rotation between the swash plate and fixed pinions.

The second form of construction is conveniently made use of when it is desired to eliminate worm and worm wheel gearing and to use straight cut gears only.

The constructions of the pump described above permit a regular and very small amount of liquid to be pumped at substantially high pressures, and the invention is of particular use in, for example, complex machinery wherein a plurality of bearings require minute quantities of oil at regular but infrequent intervals.

Dated this 6th day of April, 1948.

CHATWIN & COMPANY,

253, Gray's Inn Road,

London, W.C.1,

Patent Agents for the Applicants.

[Prior 2/8]

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## COMPLETE SPECIFICATION

## Improvements in or relating to Reciprocating Pumps

We, JOHN GANE SHIRLEY BARROW and  
MICHAEL WENTWORTH EWART-WENT-  
worth, both British Subjects, of 44,  
Montrose Place, Chapel Street, London,  
5 and 2, New Square, Lincoln's Inn,  
London, W.C.2. respectively do hereby  
declare the nature of this invention and  
in what manner the same is to be per-  
formed, to be particularly described and  
10 ascertained in and by the following state-  
ment:—

This invention relates to pumps of the  
kind in which a plurality of pistons are  
actuated by a cam drive, its object being  
15 to provide an improved construction hav-  
ing a very high reduction gear.

According to the present invention, a  
pump comprises a plurality of pistons  
arranged in cylinders and actuated, by  
20 the rotation of a cam, in the axial direc-  
tion of said cam which is provided with a  
number of circumferential teeth in en-  
gagement with a planetary pinion which  
also meshes with a fixed pinion  
25 coaxial with the cam and having a  
different number of teeth, the planetary  
pinion being moved in an annular path  
about the said fixed pinion by means of a  
driving annulus.

In a simple construction, the cam com-  
prises a pinion arranged coaxially with  
another fixed pinion, both said pinions  
being in mesh with the planetary pinion  
which is moved in an annular path  
35 between the fixed pinion and internal  
teeth on the annulus, the said annulus  
being driven by means of a worm engag-  
ing teeth on its periphery.

The planetary pinion may be elongated  
40 so as to engage with the pinion of a second  
cam arranged at the other side of the  
fixed pinion, whereby the pump can have  
a double set of pistons.

In a second form of construction, the  
45 cam may itself form a pinion, and have  
teeth on its periphery to engage with the  
planetary pinion which is also in mesh  
with a fixed pinion arranged adjacent to  
the cam. The planetary pinion is moved  
50 in an annular path about the fixed pinion  
by the rotation of the driving annulus by  
which it is carried, and which is in turn  
driven by means of a spur gear coacting  
with teeth thereon.

55 The cam pinion and the fixed pinion  
have the same pitch circle to engage with  
the planetary pinion, but have a number  
of teeth differing by a small number,  
whereby the planetary action of the

planetary pinion causes a differential 60  
relative rotation between the cam plate  
and fixed pinions.

The second form of construction is con-  
veniently made use of when it is desired  
to eliminate worm and worm wheel gear- 65  
ing and to use straight cut gears only.

The constructions of the pump  
described above permit a regular and very  
small amount of liquid to be pumped at  
substantially high pressures, and the 70  
invention is of particular use in, for  
example, complex machinery wherein a  
plurality of bearings require minute quan-  
tities of oil at regular but infrequent  
intervals. 75

In order that the invention may be  
more fully understood it is shown by  
way of example in the accompanying  
drawing wherein:—

Fig. 1 is a vertical section through a 80  
first construction, and

Fig. 2 is a vertical section through a  
second construction.

In Fig. 1, 1 is a cam fast to a pinion 2  
and loosely mounted on an axle 3 which is 85  
made fast to the casing and carries a fixed  
pinion 4. 5 is a planetary pinion which  
engages with the outside of pinions 2 and  
4 and with the inside of an annulus 6 pro-  
vided with internal teeth 7 and driven by 90  
means of a worm 8 engaging on gearing  
9 on its outer circumference. 10 are  
pistons actuated axially in cylinders 11  
by the rotation of the cam 1.

Only one cam 1 is shown in this figure 95  
for clarity but it can be seen that another  
similar cam could be provided on the  
right hand pinion 12 which is in all  
respects similar to pinion 2, and said  
second cam could be made to operate 100  
another set of pistons, similar to pistons  
10 but placed at the right hand side of  
Fig. 1.

In Fig. 2, 13 represents pistons which  
are movable in cylinder members 14 and 105  
are actuated by a cam 15 having circum-  
ferential gearing 16, engaging with a  
planetary pinion 17 which also meshes  
with a fixed pinion 18 coaxial with the  
cam 15, by means of gearing 19. The cam 110  
15 is provided with gearing 16 which has  
a small number of teeth either more or  
less than the gearing 19 of the fixed  
pinion 18. The planetary pinion 17 is  
carried round the pinion 18 and plate 15 115  
by an annulus 20 having internal gearing  
21 and driven by means of a driving  
pinion 22. 23 is a balance weight which

can optionally be provided on the annulus 20 to balance the planetary pinion 17.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:—

1. A pump comprising a plurality of pistons arranged in cylinders and actuated, by the rotation of a cam, in the axial direction of said cam which is provided with a number of circumferential teeth in engagement with a planetary pinion which also meshes with a fixed pinion coaxial with the cam and having a different number of teeth, the planetary pinion being moved in an annular path about the said fixed pinion by means of a driving annulus.
2. A pump as claimed in claim 1 wherein the planetary pinion is moved in an annular path between the circumferential teeth of the cam and fixed pinion and internal teeth formed on the annulus.
3. A pump as claimed in claims 1 and 2 wherein the annulus is driven by means of a worm engaging with suitable teeth on the periphery of the annulus.
4. A pump as claimed in claims 1, 2, or 3 wherein the planetary pinion is elongated to permit engagement with the pinion of a second cam disposed at the other side of the fixed pinion and actuating another set of similar pistons.

5. A pump as claimed in claim 1 wherein the planetary pinion is rotatably carried by the annulus.

6. A pump as claimed in claim 5 wherein the annulus is driven by means of a driving pinion engaging with teeth on the said annulus.

7. A pump as claimed in any one of the preceding claims, wherein the fixed pinion and the or each cam have the same pitch circle.

8. A pump as claimed in any one of claims 5, 6, or 7 wherein the annulus is provided with a counterbalance weight to balance the planetary pinion.

9. A pump as claimed in any one of the preceding claims, constructed and arranged substantially as shown in the several figures of the accompanying drawing.

Dated this 26th day of August, 1948.

CHATWIN & COMPANY,

253, Gray's Inn Road,

London, W.C.1,

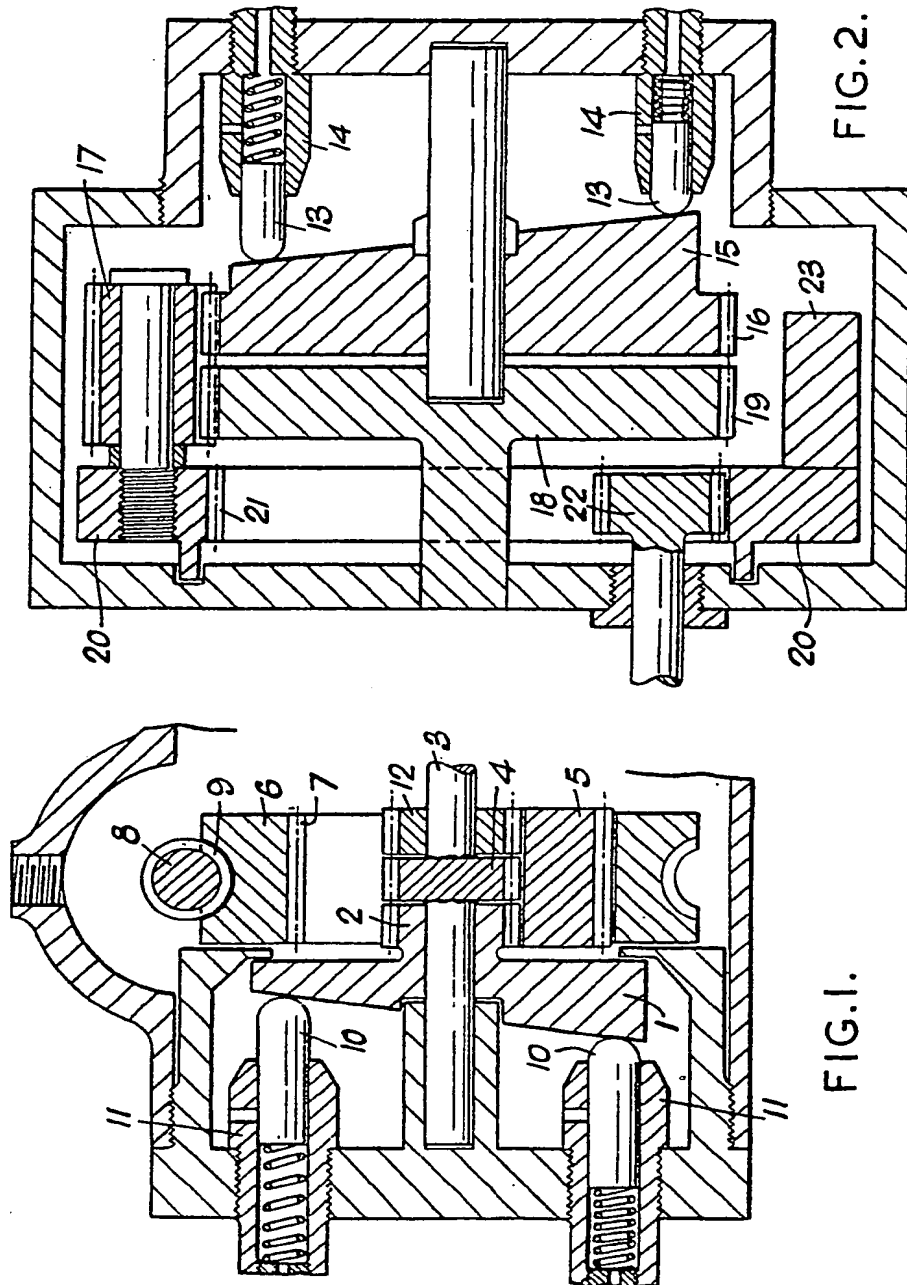
Patent Agents for the Applicants.

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675,754 COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of  
the Original on a reduced scale.



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